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THE PATHOLOGICAL ANATOMY OF SURGICAL STUMPS.

By Dr. Chauvel (Army Medical Staff).

Translated for the Journal from the Archives Générales de Médecine for March, 1869, by B. E. Cotting, M.D., of Roxbury.

While two years attached to the Infirmary of the *Hôtel des Invalides*, we dissected and examined all the surgical stumps of those who died there during that period, and we propose to give a condensed statement of the results of our researches in the following paper, after a few words on the history of the subject.

History.—The first observations on the condition of surgical stumps date from the close of the last century. They were made in Germany, and form two inaugural theses. (Dezeimeris, Dict. de Méd.—Art. *Amputation.*)

In France Larrey took up these researches during his residence at the *Invalides*. The conclusions he arrived at may be found in volume third of his *Clinique Chirurgicale.* He insists mainly on the changes which take place in the divided nerves. He verifies the tumefaction of their extremities, from which (according to him) very delicate filaments issue to lose themselves in the cicatrices. He considers these filaments conductors of animal electricity. He meets with unusual reunions of divided nerves in three stumps of the arm; and sees in these nerve-anastomoses a provision of nature to prevent loss of nervous fluid by thus insuring its return to its source.

Changes in the osseous extremities did not escape notice. According to him, when these serve as supports upon their whole surface, they enlarge, and the ends become flattened, like nail-heads. On the contrary, when not pressed upon, or when hanging free, the ends diminish in all directions and become rounded; the medullary cavity closes up, and the fibrous periostic tissue adheres to the cicatrix. Larrey sustains these views by seven autopsies.

Cruveilhier (*Anat. Path.*, iii. p. 755), under the name of *traumatic neuromata*, designates the bulbs usually developed on the ends of the nerves in surgical stumps. He attributes their formation to the friction and pressure necessarily endured by these parts, as such formations never occur when nerves are divided in continuity. Dissection shows, says he, that nerve-filaments spread out into the surrounding mass, and are soon lost; but the supposition of anastomosing loops is, he thinks, without foundation in fact.

Guthrie (*Comm.*, p. 75) relates that he once knew an operation to be proposed where tenderness of the terminal bulb of the sciatic nerve, after amputation of the thigh, had been mistaken for disease. Fortunately he was able to dissuade the patient. We have many times endeavored to feel the terminal bulb of the sciatic nerve in patients whose thighs had been amputated, but have never been able to find it.*

Hutin (*Anat. Path.*, *&c.*—*Mém. Acad. Méd.* 1855), long time Chief Physician of the *Invalides*, paid great attention to the condition of the several parts forming the stump. He studied the cicatrization of the arteries, finding them sometimes converted into fibrous cords, sometimes permeable to the very extremity, being simply obliterated by a long plug of fibrin, thick and discolored, without trace of organization.

He also examined with much care the nerve-bulbs, their appearance, structure, and termination. According to him, the filaments which issue from them are either nerve fibres, or simple cellular prolongations furnished by the neurilemma. The nascent bulb is formed by the retraction of the nerve substance within the neurilemma stretched by the cicatrix. At a later period it becomes more or less increased in size by addition of fat and hypertrophy of the neurilemma. He declares that re-union, end to end, of divided nerves does not exist in reality. By chance, nerves may be found involved in common fibrous tissue, and thus apparently re-united, but there is never a true reunion of their substance.

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* . . . "The extremity of the principal nerve, which always enlarges, assumes a bulbous form, and is painful on pressure when made for the purpose, although not so under ordinary circumstances."—*Guthrie, Com.*, 1855, p. 75.—Tr.

The bones, he says, soften at their extremities; their walls contract; and the medullary cavity closes by a calcareous deposit in the cicatricial tissue. This substance in excess often forms prolongations, spines, and considerable masses, which, by pressure on the soft parts and nerves, cause severe pains to patients.

M. Notta has endeavored to show that the fibrous cord continues even to the cicatrix, and what is usually thought to be the obliterated artery is in reality only inodular tissue formed by the cicatrization of a fistula produced by the thread of the ligature.

Lobstein (*Anat. Path.*) calls attention to the mucous bursæ sometimes occurring on the osseous extremities in stumps; formed there, he thinks, by the repeated frictions these parts are liable to.

Legouest (*Chirurg. d'Armée*) admits the re-union of the nerve-extremities end to end. He describes growths on the ends of bones, from specimens in the collection of M. Hutin, and gives figures of some of the most remarkable. He points out a different result in this respect, after disarticulations, where the bones, he finds, become atrophied.

Alphonse Guérin (*Nouv. Dict. de Méd. et de Chir. Prat.*, ii. p. 87) doubts the propriety of regarding the nerve-swellings in stumps as a disease like neuroma, whose symptoms they are far from presenting.

We may mention, also, as bearing upon our subject, a notice of the atrophy of arterial walls by Maurice Raynaud (*Nouv. Dict. de Méd. &c.*, iii. p. 232); and Nélaton's view of the transformation of an artery into a firm ligamentous cord (id. iii. p. 172). He regards this as constant after a section of a vessel, and as the normal mode of vascular obliteration.

Researches.—Our own conclusions are based upon thirty-two cases, as follows:—

Amputations, thigh	upper third,	3
	middle "	4
	lower "	4—11
" leg	. . . . .	8
" arm	. . .	6
" forearm	. . .	1
" hand	. . .	1
Disarticulation, ante-scaphoid	. .	1
" shoulder	. . .	4
		32

In a general view, the form of the stump varied with the member amputated. In limbs of one bone (thigh, arm) the stump always tended to conicity. This was produced by muscular retraction, and sometimes had been increased by wearing an artificial limb. The skin was also retracted, and the cicatrix in this way so drawn upon as to keep up the tendency of the bone to protrude.

There was less conicity in members of two bones, as the shorter muscular fibres were fixed to the bones near by, and the skin, held down by more compact cellular tissue, had less freedom in retraction.

On first section of a stump one is struck by the abundance of fibrous tissue, dense and firm, enveloping the osseous extremity. It attaches muscles, nerves and vessels to the cutaneous cicatrix, and thus serves as a common bond, uniting all these dissimilar parts. Its volume is increased at the expense of other substance lost by the operation.

The actual state of the stump in our cases varied according to the disease to which the patient succumbed. If he died of a constitutional affection, cancer or tubercle, the stump shared the atrophy and emaciation characteristic of the last stages of such diseases. Its skin was then dingy and sallow, the muscles were atrophied, and all the parts infiltrated with serum. If, on the contrary, the patient continued in good case, the stump remained well nourished, while a deep layer of fat thickened the skin and enveloped the thoroughly degenerated muscles.

State of the Cicatrices.—Can the method of operation be made out by the form and position of the cicatrix? Not easily, says M. Legouest and rightly. In almost all the cases we examined the circular method had been practised; and, nevertheless, in our eleven amputations of the thigh, for example, we found six circular and five linear cicatrices, almost invariably drawn a little backwards and inwards. The cicatrix, in short, varied according as the union was wholly or in part by first intention, or interrupted in any way in its usual course.

In two disarticulations of the shoulder, however, the cicatrix clearly indicated the method employed, that of Larrey in the first, of Dupuytren in the second. In the amputations of the leg and arm, the method could not be ascertained by the cicatrix.

Cicatrices resulting from the same method not only varied in form and extent, but also in their nature and color; sometimes smooth, dull white, and quite thin, at other times violet, rugous, deeply injected and of great thickness. Generally the cicatrix adhered to the end of the bone by short interwoven fibrous bands. Occasionally these bands were elongated, and formed a mucous subcicatricial bursa. We met with such a bursa three times.

State of the Muscles.—Fatty degeneration of the muscles has been described by all writers. It was recorded, with the atrophy that accompanies it, in almost all our observations. Naturally, a muscle unused loses its powers and normal structure. This is a gradual transformation, and requires considerable time. We met with it in all degrees, both in different subjects, and in different muscles of the same stump. In some the change was so slight that the color, volume, and tenacity of the muscle were as of healthy tissue; and the loss of striæ, if any, in its fibres, and commencing granular condition, were ascertainable only by the microscope. In others the degeneration was so complete that the naked eye could perceive only a shiny, bleached, and almost fluid mass, breaking down under the fingers; while the microscope revealed large globules of fat, and only here and there vestiges of primitive tissue. In these results not only age had an influence, but nutrition also, in its bearing upon the general health and free circulation.

Nevertheless, it must not be thought that every muscle divided in amputation must of necessity become atrophied and fatty. Sometimes when thus deprived of one point of attachment the muscle soon begins to acquire others. It fixes itself upon the new formations of bone, or finds a point of support in the common fibrous tissue to which itself contributes a portion, and, in as far as its nerves are not destroyed and its functions are called into action, we find its volume and structure preserved. We do not state this upon hypothesis; five of our observations demonstrated the truth of the assertion.

We need not add more upon fatty degeneration, as it has been studied for a long time, and is now well understood.

State of the Vessels.—Many and very important works have been published on the cicatrization of vessels cut in continuity, having for their special object the mode of occlusion of arteries. The solution of a problem in pathological anatomy has not been so much sought for as the surest way to obtain a closure of the vessel. Ligation continues still the usual practice in amputations.

Our observations have been confined to stumps long after cicatrization had finished, and therefore we will now discuss only the following points:—

Does the fibrinous clot-plug continue indefinitely in the vessel?

Is the clot susceptible of becoming organized and of establishing with the vascular wall intimate adhesions, fully organized and traversed by vessels?

Can the clot-plug be completely absorbed; and in such case can the walls of the vessel unite so as to form only a fibrous cord?

Does the arterial wall become thin, so as to resemble that of a vein?

M. Hutin, in his remarkable work, records the persistence of the clot-plug, filling the cavity of the vessel, long years after the amputation. This we have met with nine times in thirty-two cases, or one more than a quarter part. In all these cases the clot was fibrinous, whitish, firm, and formed in concentric layers—variable in dimensions and extent. It was sometimes prolonged up to the first important collateral from the very extremity of the artery; at others no collateral marked its upper limit, while below it was lost in the walls of the artery so closely united as to transform the vessel into a simple fibrous cord.

In none of these cases did the clot-plug present any traces of organization. Microscopic examination showed only fibrin more or less disaggregated, never any vessels. Sometimes the adhesions to the arterial walls were very intimate, but more often the clot separated readily.

The absorption of the clot-plug, with the intimate and complete fusion of the walls of the artery, which was thus transformed into a simple fibrous cord, was met with more frequently. We noticed this in fourteen, or almost half our cases. This transformation varied greatly. The adhesions were rarely abrupt; and the vessel seldom maintained its normal calibre upwards. Accompanied by a vein still more feeble than itself, and proportioned to the parts to be nourished, the artery at once began to lose its dimensions. As it approached the stump it contracted, sometimes gradually, sometimes suddenly after having given off an important collateral. This diminution of calibre was noted fifteen times in thirty-two cases, and this, too, where the anatomical situation permitted the easiest demonstration of its reality. It was thus that in amputation of the arm at the upper third, and in disarticulations of the shoulder, the axillary artery, after having furnished scapulary branches, shrivelled and became a true arteriole. There was no further occasion for it.

In one instance only have we noticed the vascular wall thinned, resembling that of a vein. Oftener, four times, we have found it notably thickened.

Besides these two modes of termination, sometimes the artery continued permeable even to its extremity, without clot-plug or fibrous terminal cord. Then the calibre either gradually diminished to the point of closure, or, on the contrary, remained unchanged, presenting the appearance a vessel should have immediately after ligation, i.e., a true *cul-de-sac*. When the latter occurred, a cluster of arterioles was not infrequently found arising from this *cul-de-sac* to spread themselves into the common fibrous tissue. We have met with this permeability eight times, and in half of these cases the calibre of the vessel remained unaltered to its extremity.

With M. Hutin, we have very seldom met with a fibrous cord which prolonged the artery to the cutaneous cicatrix, or that which M. Notta thought to be an inodular band, corresponding to the former passage of the ligature of the vessel. We have always found the artery itself terminating at a distance from the cutaneous cicatrix, varying according to the greater or less hindrance to the vessel's retraction. Cut in the middle of the thigh, the artery will retract strongly within its sheath. It preserves its original position only when retained in it by fibrous adhesions.

We have not found atheromatous degeneration when present more frequent or more advanced in the arteries of the amputated member than in other parts.

State of the Veins.—Cicatrization of the veins has not been studied with the same care as that of the arteries. The direction of the sanguineous current and the presence of valves opposing its return, render, in fact, venous hæmorrhages less frequent than arterial. If a vein is tied, obliteration seems to take place by adhesive phlebitis, forming a clot which is afterwards absorbed. The walls of the vessel then immediately fall together, and are soon completely united. Thus, at least, we have always found it in our investigations.

State of the Nerves.—Nerve-anastomosis, maintained by Larrey as a constant fact, and denied by Hutin who saw in it only a simple contact, has never appeared under our observation. Once we saw an internal cutaneous nerve seeming to be confounded by a loop with a median in the same terminal enlargement, but it was only a semblance, a simple juxtaposition of the terminal neuromata of these two nerve-trunks.

Sometimes two nerves in contact were thus commingled in the terminal tumor. Sometimes a whole cluster of nerves were likewise englobed in one neuroma, as was especially seen in disarticulations of the shoulder. But even in these cases there never was an anastomosis. At one time the separate neuromata were intimately united to form one single mass where each, nevertheless, could be distinguished. At another time these neuromata, although buried in a common adipose tissue, had no connection whatever between themselves. We met with each of these conditions four times in eight amputations, of the arm and at the shoulder-joint.

We may conclude, then, that real nerve-anastomosis is very questionable; that even apparent anastomosis is very rare; and that, for the most part, the nerves have isolated terminations, although their extremities be enclosed in the same fibrous cicatricial tissue.

Larrey first demonstrated the termination of the divided nerves of a stump in a tubercle more or less voluminous and rounded; from which, according to him, nerve-filaments diverged to conduct the animal electricity to the cicatrix.

Now, nerves for which there is no longer any use, present to the naked eye normal dimensions and aspect; and, on section, we almost invariably found them healthy under the microscope. But in a certain number of cases we met with the following state of things:—

On longitudinal section three layers were readily made out:—1, the external, thin and white, formed by the neurilemma, a dense connective tissue; 2, the middle, yellow and often increased by adipose matter as it approached the terminal protuberance, being composed of a very loose connective tissue, with interspaces filled with fat; 3, the central, consisting of a white cord, variable in thickness, and dividing so as to be lost in the terminal bulb. This cord was composed exclusively of unaltered primitive nerve-fibres.

This condition we have only seldom fallen in with. Is it a cadaveric phenomenon, the result of an alteration of a nerve after death? Nothing appeared that could give rise to such a supposition; and there were no peculiarities in the subjects adequate to the solution of the question. The autopsies were made at equal intervals after death. We must add, however, that we have met with this condition only in obese individuals, in stumps loaded with fat, and where the muscles were fatty in the highest degree. It gradually diminished upwards, and entirely disappeared four or five inches above the terminal neuroma.

We find that all authors (Larrey, Hutin,

&c.) lay stress upon the club-like termination of nerve-cords cut in amputation—a result differing from that obtained in experimental nerve-sections, where the central end of the divided nerve is found to retain nearly its normal size to the point of cicatrization.

In concurrence with M. Hutin, we ought to state that this protuberance is not constant. In our examinations it was wanting twice in amputations of the thigh, twice in the leg, once in the arm; and this, too, sufficiently long—five years or more—after the operations.

In all our other cases the nerves have presented these little tumors; variable in development, yet always in proportion to the size of the nerve-trunk. Eight times, according to our records, they were not remarkable; sixteen times, they were voluminous. We shall see presently whether it is possible to explain these variations.

Four times we have met with many such tumors developed along the course of the same nerve near its extremity; once on the tibial saphena, once on the external popliteal sciatic, and twice on the median; without anything to explain the peculiarity.

In general, the protuberance is, as it were, a continuation of the nerve on which it is developed; sometimes, however, it seems to be merely in apposition.

Each nerve appears to have its special and very distinct neuroma. This should be so, necessarily, when their extremities are apart from each other. But the same condition is found also when nerve-trunks are divided at a point where they are brought quite together, as in the axilla, for example. Besides, it is not astonishing that all such neuromata, naturally in contact, should, though distinct, be englobed at their inferior portion in a common fibrous mass connected with the cicatrix. The fibrous bundles of hypertrophied neurilemma adhere, interlace, and form this common portion of the protuberance.

In a single case of disarticulation of the shoulder, we found the extremities of the nerves so lost in the common mass that it was impossible to separate them or to distinguish their particular bulbs.

These protuberances generally had an elongated shape, in the direction of the trunks of the nerves. They varied greatly in size, even on the same nerves, under apparently identical circumstances. In eleven stumps of the thigh, the sciatic terminated seven times in quite large tumors, once in a small one, and three times without enlargement.

Seven patients used, in walking, the padded long peg (cuissard), having its principal point of support at the ischium, and being retained in place by a leather belt around the pelvis. In six of these the sciatic bulb was very large. In one there was no terminal neuroma.

The remaining four used crutches. Of these, one had a very large, one a very small, and two no apparent tumor of the sciatic. Almost all the operations dated far back—the most recent as far as 1854–55.

It would seem, then, that the apparatus used in walking had some influence in the production of these swellings; how much we shall soon see, and how it may be understood and explained.

The position of these tumors varied with that of the nerves on which they were situated, and they were greatly modified by their connections with the neighboring parts. When the nerve was in the midst of the cellulo-adipose tissue, loose in surrounding parts, as the sciatic, the axillary plexus, &c., we found the neuromata free also in the fatty mass, and attached only to the cicatrix by the lower extremity. When, on the contrary, the nerves were fixed at the point of division, as, for instance, the radial in the humeral groove, and by external intermuscular aponeurosis, or the external popliteal sciatic at the neck of the fibula, then the terminal protuberance was often found englobed in the fibrous cicatricial tissue, and at times inseparable from it.

These tumors presented to the naked eye a smooth, pearl-white surface, and elastic consistence. Free throughout most of their extent, they were almost always attached to the cicatrix by fibrous prolongations from their inferior extremities. Once only have we found the tumor completely free, without any connection with the fibrous tissue.

So great was their elasticity that it was difficult to cut them with scissors, or even with the scalpel. They presented a rosy-white, cut surface, with yellowish or at times still whiter and glaring patches at the centre and borders, or over the mass. In other respects these tumors were so variable that it is impossible to give a general description applicable to all. Nevertheless two portions could ordinarily be made out:—1, the exterior envelope, the continuation and manifest expansion of the hypertrophied neurilemma, which could be traced onward even into the fibrous cord attached to the cicatrix; 2, the central portion, which appeared to be rather the expansion of the nerve itself and of its tissue more or less modified.

We have said that the neurilemma spread out disunited bundles over the tumor, to form its external layer. Farther on, these bundles again approached each other, and condensed to form a simple fibrinous cord, which disappeared in the common fibrous tissue. Very rarely, these bundles continued, as it were isolated, even to their union with the cicatrix. But we have never met with the nervous fibrils which Larrey regarded as the conductors of animal electricity, and which M. Hutin has sometimes also observed.

Are these nerve-bulbs, which Cruveilheir described under the name of *traumatic neuromata*, in reality tumors of such a nature? Are they true nerve-tubes in their structure, or simply, as Legouest and A. Guerin thought, the result of hypertrophy of the connective tissue? Let us admit in the first place that in external characteristics, form, color, aspect, consistence, &c., these tumors greatly resembled common neuromata. But they differed from the latter decidedly in the symptoms produced. Spontaneous, sharp, and sometimes insupportable pains are constant attendants on pathological neuromata. In stumps, on the contrary, so far as we have been able to observe them, such pains are rare compared with the frequency of traumatic neuromata. But the histological structure is the same in both, and this settles the question. Microscopic examinations which we practised in almost all these cases, and which MM. Paulet and Villemin kindly repeated, enable us to affirm in all of these tumors the presence of true nerve-tubes.

Two elements concurred to form these bulbs—the compact fibres of connective tissue, and the bundles of nerve-fibres. On the surface of the exterior appeared only fibrous tissue, arising from the hypertrophied neurilemma which enveloped the tumor. The internal part, or the tumor properly so-called, was formed of very dense connective tissue, in which meandered bundles of nerve-fibres, more or less abundant, and more or less in apposition. Infrequent at the periphery, these nerve-bundles became so numerous in the central tract as to suggest a local development of nerve-fibres.

These tumors were, then, true neuromata, as Cruveilhier and Hutin considered them.

We have never seen nerve-fibres pass the limits of the tumor. The ligamentous cords and the loops which attached it to the common fibrous tissue were exclusively formed of bundles of connective tissue, re-united in one instance, isolated and distinct in another. Even when there was no terminal bulb, the fibrous cord, almost uniformly present, was never composed of anything but connective tissue.

[To be continued.]

AN AMUSING CHAPTER IN THE NOMENCLATURE OF SKIN DISEASES.

By James C. White, M.D.

No writer has done so much to increase the unfortunate confusion which exists in connection with the nomenclature of cutaneous diseases as Mr. Wilson. For a long time and until a recent period looked upon as the leader in this department of medicine in England and this country, he has never let slip the opportunity of introducing new and of altering old names in his writings. In his latest editions and in the numerous articles published in his Journal of Cutaneous Medicine, many of which are the merest twaddle, this propensity to invent long Greek titles, or to hunt up others forgotten for centuries and never used with any definite meaning, amounts almost to a mania. Among the most amusing of these exhibitions, and a fair illustration of his whimsical mutability, is that afforded by the list of names adopted by him from time to time in connection with Psoriasis.

Up to the 4th edition of his work he had called this affection Lepra, applying the former, its proper title, to a variety of chronic eczema. In the preface to his 5th edition, published in 1863, and written immediately after an interview with Professor Hebra "amidst the academic groves of Richmond Hill," we find the following change announced:—

"To return to Hebra. The term Lepra—*der Aussatz* in German—signifies *the* eruption, the great eruption. It is synonymous with Leprosy, *the* leprosy, the ancient leprosy, that which has since been called elephantiasis. Therefore let us bestow the term lepra where it rightfully belongs, or reject it altogether. The trivial affection which we at present call lepra has no single point of comparison with leprosy. We cannot but admit the truth of this argument, and we cannot, also, but recognize in an instant the monstrous absurdity of calling a comparatively insignificant disease by so portentous a name.

"Now, Hebra cuts the Gordian knot. Eczema he calls eczema; lepra, lepra; and that very common affection which we at present term lepra, he calls psoriasis. The change is simple, the reasons for it important. We cannot do better than adopt it. Moreover, it suits *the spirit of the British bull-dog* to call things by their proper names, and we are too noble in our nature not to recognize and value the intellect of our foreign brethren. The great International Exhibition of 1862 will not have existed in vain, if it have accomplished no more than to enable us to give the proper name to a very common and troublesome disease."

Considering the reputation for tenacity of the canine species here mentioned, it might be presumed that this matter of title was definitely settled, but in the "Student's Book of Cutaneous Medicine," published in 1864, the "intoxication" produced by the "fascinations of his agreeable friend" (Prof. H.), seems to have subsided, for Richmond Hill is ignored, the term Psoriasis being still retained for this form of chronic eczema, while his old Lepra is called Alphos.

In April, 1868, this Gordian knot appears to be still uncut, and a positive reaction has taken place in the temper of the British bull-dog, for in an article on this affection, no longer Alphos but Lepra again, published in the Journal of Cutaneous Medicine at that time, we find the following recantation: "Nothing can be more outrageous than the blunder of calling Lepra vulgaris, Psoriaris: happily it is a foreign blunder; but we trust that there are few amongst us who are so lost to the proper estimation of nationality as to submit blindfold to the foreign yoke. We have no objection to accept the truth at the hands of our foreign brethren, but once and for all we reject their falsehood; and we have a proper disdain for the spirit of *gobe-moucheism*, which is at all times ready to gulp down "omne ignotum pro magnifico."

Later in the same year (October) he calls Psoriasis, Lepra Alphos; and in January, 1869, another alteration is introduced, and the title Lepra græcorum is adopted. In this latter article, a review of Hebra's work, he again says "it would be a serious mistake to confer on Lepra so unsuitable a designation as that of Psoriaris, as is proposed by our Austrian colleague. We trust that our countrymen will agree with us in our objection, and resist an attempt at the alteration of our nomenclature, which is pressed upon us inconsiderately, and with an authority which we think it absolutely necessary to resist."[1] To this a writer in the Edinburgh *Medical Journal* of March, if we mistake not, the well-known author of the best works on skin diseases published in Great Britain, replies:—"And but small excitement do we feel in the approaching contest which Mr. Wilson announces as about to take place between himself, a self-elected champion of Britain, and Hebra, as the supporter of the honor of Germany; notwithstanding the flourish of trumpets with which Mr. Wilson accepts the fancied challenge, and calls upon all interested to form a ring, and be judges of the fairness of the strategy. For it is just possible that the personal appearance of his German opponent in the field may once again be sufficient for victory, and enable him to return to his country singing the exulting pæan of *veni, vidi, vici.*"

What change of title the next quarterly issue of his Journal will bring with it, time will show.

Hospital Reports.

BOSTON CITY HOSPITAL.

Reported by FRANK W. DRAPER, M.D., House Surgeon.

Aneurism of the Innominate Artery. (Service of Dr. CHEEVER.)—Fourteen weeks before his entrance to the Hospital, the patient, a strong, well-built, perfectly healthy laboring man, aged 38 years, first noticed pain between the scapulæ, with continuous cough. The symptoms were exacerbated by unusual exertion, and after three weeks he was admitted to the Mass. General Hospital to be treated for his cough. Seven weeks of treatment in great measure relieved this symptom. At the time of his discharge, nothing abnormal had been noticed about the heart or the adjacent arteries. Meanwhile the pain in the back continued, and a sensation of cold in the shoulders and down the arm, and of numbness in the right arm, were superadded.

Very soon after his discharge from the Hospital, and four weeks before his entrance to the City Hospital, his attention was first called to a pulsating tumor near the upper border of the sternum and a little to the right of the median line. The cough recurred, and exertion induced various uncomfortable sensations, referred to the shoulder, the arm and the seat of the tumor, and three weeks before he appeared at the City Hospital, the tumor had so far developed as to press on the recurrent laryngeal nerve sufficiently to cause hoarseness.

He entered the Hospital with the following appearances and symptoms. On examination, the right side of the neck was observed to be markedly enlarged. The sterno-mastoid muscle was thrown outward. The general aspect of the patient tended toward lividity. Just within the right sterno-clavicular articulation could be felt a pulsating tumor, which rose above the articulation and presented a regularly ovoid outline, its apparent size being that of a goose-egg. The pulsations were strong, and the sac appeared thin and superficial. The impulse was transmitted in a marked degree to the adjacent regions. The right external carotid artery could hardly be felt, and it was doubtful whether it was determined at all; the left pulsated normally. There was no perceptible difference in the pulsation of the two radial arteries. Auscultation discovered nothing abnormal in the cardiac sounds or in the aorta. There was a well-marked bruit in the tumor. The patient was harassed by a cough, and there were abundant moist râles in both chests. The hoarseness was a very marked symptom, and was accompanied by wheezy, croupy cough, like that after tracheotomy.

The general condition of the patient had not suffered materially. The appetite was good; pulse 96, regular.

During the week following his entrance all the symptoms were aggravated, and the physical appearances became daily more grave. A consultation of the surgeons determined the tumor to be an aneurism of the innominate artery, and that the question of operative interference should be left to the decision of the patient himself.

The decision of the patient being in favor of an operation, he was etherized in the recumbent position, the process being conducted slowly and with difficulty, on account of the increasing dyspnœa. The lividity, which at the outset was considerable, was much increased. Etherization occurred after twenty minutes, and ℥viij. of ether were used. When the patient was placed on the operating table he was breathing very laboriously, and the face had assumed a dark-blue aspect. The ether was suspended and not resumed, and there was subsequently, until the end, no reaction, the patient continuing in a comatose state, breathing heavily and at times with the greatest difficulty.

The operation was with a view to the ligation of the right common carotid artery and the right subclavian. The first incision was made for the tying of the former vessel, in the apex of the superior carotid triangle. From the first cut, the venous hæmorrhage was excessive, welling up in the wound in spite of vigorous sponging, each new cut causing fresh bleeding. The operation was conducted by feeling alone. The edge of the sterno-mastoid was reached and lifted, but the finger failed to detect any pulsation. The attempt to ligate here was abandoned for the time being, as it was hoped that after the subclavian was tied pulsation might be evident in the carotid.

The incision was next made for the ligation of the subclavian in its third portion. The same difficulty was experienced with the profuse venous bleeding as before. The blood was now fully carbonized, and welled up in a continuous inky stream. No landmarks were seen, and the operation was carried on by careful picking with the director. The artery was reached and held under the finger. The subclavian aneurism needle was passed from before backwards and below upwards, and as it emerged from under the artery a smart gush of venous blood filled the wound, at once obscuring everything and causing the patient to gasp, and the pulse to fall so low that it could not be felt. Stimulation caused partial reaction.

Efforts were now directed towards securing the subclavian vein, which had probably been ruptured through its thinned and dilated wall, by the passage of the needle, close to its junction with the innominata. The wound was enlarged in all directions; the sterno-mastoid was cut and reflected, and the incision carried on until the aneurismal sac was exposed, and as much room gained as possible with safety. A section of the clavicle was made with a Hey's saw, and a portion of the middle third, an inch and a half long, removed.

Meanwhile the patient's condition was becoming increasingly alarming. The dyspnœa had developed to the gasping respiration of the moribund state; at times there was complete suspension of both pulse and respiration. The blood was of the color of prune-juice. The face was dark blue. There was no consciousness. The pupils were partially dilated. The extremities were cold.

Further attempts were now desisted from, as the patient was plainly *in articulo mortis.* The wound was plugged, and warmth and stimulants were applied. Death occurred two hours subsequently.

Post-mortem Appearances.—The heart, arch of the aorta and adjacent vessels, with the aneurismal sac, were hastily removed through the wound in the neck. The heart was healthy, and the arch of the aorta and

ENGRAVED ON STEEL FOR THE MEDICAL RECORD

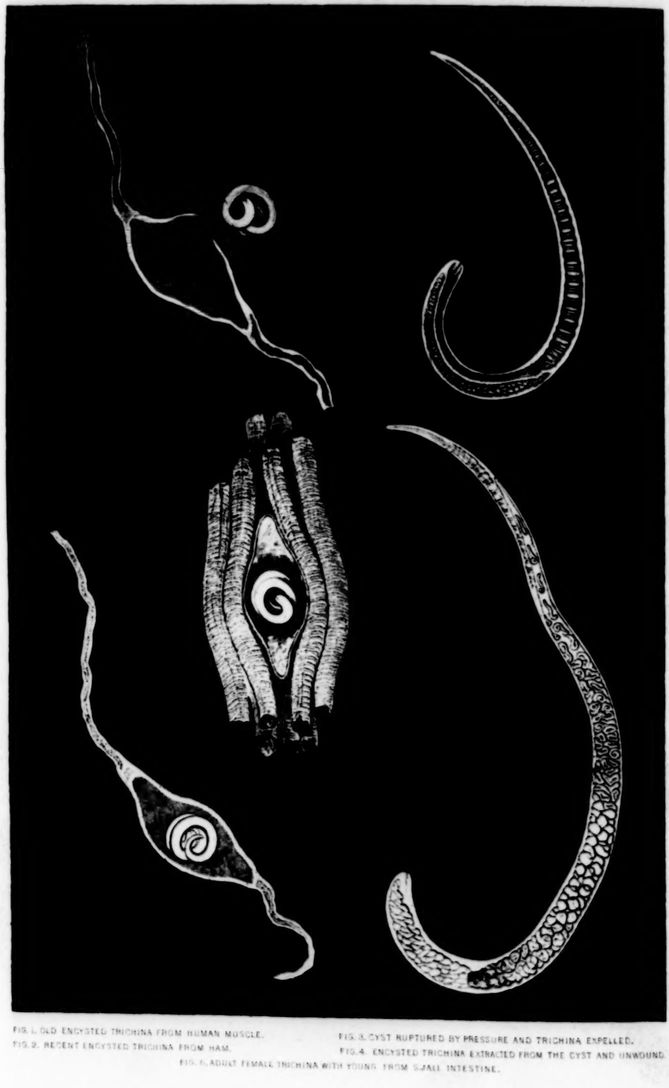

FIG. 1. OLD ENCYSTED TRICHINA FROM HUMAN MUSCLE.
FIG. 2. RECENT ENCYSTED TRICHINA FROM HAM.
FIG. 3. CYST RUPTURED BY PRESSURE AND TRICHINA EXPELLED.
FIG. 4. ENCYSTED TRICHINA EXTRACTED FROM THE CYST AND UNWOUND.
FIG. 5. ADULT FEMALE TRICHINA WITH YOUNG FROM SMALL INTESTINE.

the left carotid and subclavian contained nothing abnormal. The aneurismal sac was as large as an orange, and was confined to the innominate artery; its cavity contained layers of firm and of fatty fibrin, but the contents were chiefly blood. The openings into the aorta and the carotid and subclavian were normal. The vertebral artery was plugged with a firm clot from its orifice as far up as the section reached (two inches). The trachea had been pushed to the left side, and was compressed laterally, so that it had assumed a triangular shape, its calibre being considerably lessened. The inner surface of the manubrium and of the adjacent inner eighth of the clavicle were eroded and roughened. The lesions of the venous trunks could not be determined, on account of the necessary haste in the removal of the specimen. Neither was the carotid dissected up high enough to determine the fact of its occlusion.

The condition of the sac, its being wholly confined to the innominate, and the plugging of some of the trunks issuing from it, render it probable that an early operation by simultaneous distal ligature of the subclavian and carotid arteries might have so far suspended the circulation in the sac as to have led to a cure.

Death was due to asphyxia, and not to hæmorrhage. The quantity of blood lost was moderate, and wholly venous. It ought rather to have relieved the venous congestion of the brain. When we reflect upon the interruption to the aëration and circulation of the venous blood, we need not be surprised at the patient's condition and death. The trachea was compressed, and the recurrent nerve so stretched that one half the larynx was paralysed. At the same time, the vertebral artery was plugged, and the carotid diminished and probably occluded. The two great return trunks, the venæ innominatæ, passed between the aneurism and the sternum to form the superior vena cava, and were compressed by every pulsation in the sac, thus favoring venous congestion of the brain, and also dilating the jugulars and subclavian vein so enormously as to lead to great capillary venous hæmorrhage, and to rupture of the subclavian vein.

We are informed by the official accounts, which have just been published, that during the last twelve months the number of horses slain in Paris amounts to 2,400; five per cent. have been employed in making sausages, &c.

Bibliographical Notices.

A Conspectus of the Medical Sciences; comprising Manuals of Anatomy, Physiology, Chemistry, Materia Medica, Practice of Medicine, Surgery and Obstetrics. For the use of Students. By Henry Hartshorne, A.M., M.D., &c. &c. With 310 Illustrations. Philadelphia: Henry C. Lea. 1869. 12mo. Pp. 1002.

This book seems to us hardly worthy of its author. To the "student" it may afford help in "cramming" for an examination. Great care is said to have been taken to render the book *throughout* accurate. Perhaps the attempt has succeeded.

D. F. L.

Medical and Surgical Journal.

Boston: Thursday, May 6, 1869.

TRICHINA SPIRALIS.

We presume that no apology on our part is needed for devoting a large space here to giving as an extract from the *Medical Record* the following entire article of Professor John C. Dalton on Trichina Spiralis. If the motto *multum in parvo* were ever applicable, it is merited by this monograph.

We have to express our great indebtedness to Dr. Dalton for his good offices in endorsing over to Messrs. Wm. Wood & Co.—the publishers of the *Record*—our solicitations for a supply of the excellent plates which accompany the monograph; and to those gentlemen for their liberality in furnishing us the plates at cost. The illustrations are steel engravings, photographed from original drawings made by Dr. Dalton.

Trichina Spiralis: A Lecture Delivered at the College of Physicians and Surgeons, New York, Feb. 20, 1869. By John C. Dalton, M.D., Professor of Physiology and Microscopic Anatomy.

Gentlemen:—The subject of Trichinosis, to which our attention will be directed to-day, is remarkably interesting in three points of view. First of all, it is a disease of extreme importance with regard to its possible frequency, the fatality which it sometimes manifests, and the ease with which, at any time, it may show itself in a community where it has been previously unknown; at the same time it is a preventable disease; and in the third place, it is especially interesting as an instance of a malady which has been discovered, so to speak, suddenly, within a comparatively short period, although undoubtedly it has existed unrecognized from time immemorial.

Trichinosis, as you are all now aware, is a disease produced by the infection of the muscular system by a minute parasite, which has received the name of *trichina spiralis*. The existence of trichina spiralis in the muscles of the human subject, has been known for over thirty-five years. As early as 1832, little bodies were discovered in human muscle, which upon examination were found to consist of ovoid sacs, and a few years later it was found that each one of these sacs contained a minute round worm coiled spirally upon itself. This discovery was first made in the muscles of a hospital patient. In that case it was found that the trichinæ were exceedingly numerous and scattered throughout the body, in the substance of the voluntary muscles. Since that time they have been noticed, in many instances, in persons who have died from accidental causes, from pneumonia, from phthisis, and various other affections: from diseases, in a word, which would appear to be entirely disconnected with the existence of the parasites; so that notwithstanding the great abundance of the parasites, medical men were forced to the conclusion that they exerted no deleterious influences whatever upon the subjects inhabited by them.

I have here a specimen which I took myself from the human subject, some ten years ago. It is the rectus femoris muscle, and, like the other voluntary muscles in this case, it is full of these parasites. You will see here the regular appearance of the trichinæ as they are usually seen, and as they were exclusively known previous to about the year 1855. Look at this muscle very carefully; you will find, just visible to the naked eye, minute ovoid bodies situated between the muscular fibres, having an opaque envelope and a transparent, but apparently dark-colored, centre. On dissecting out these bodies with needles, it is found, as I have said, that they consist of an ovoid sac, and inside this sac the worm lies, spirally coiled. This is the old encysted trichina, such as you see in this drawing. (*Vide* Plate, Fig. 1.)

Between the fibres of the muscle, and lying parallel with them, is the ovoid sac, somewhat pointed and yet slightly rounded at its two ends, and swollen in the middle, where the worm is coiled up. Now the trichina is coiled in such a manner inside the sac, as to make about two turns and a half upon itself. One extremity of the worm is blunt and rounded, the other is more pointed, and the two lie so near each other that half a turn more would bring them together. These bodies, although so minute, are yet visible to the naked eye on close examination in such specimens as this; because, as you readily find under the microscope, they are partly solidified by a calcareous deposit in the cavity of the sac. This deposit is of a gritty and almost crystalline texture, brittle, breaking upon firm pressure, and is composed, probably, of phosphate of lime, slowly deposited, so as to give to the extremities of the sac an opaque appearance and a very firm consistency.

This is the condition in which the trichina presented itself in all specimens brought to the observation of medical men, for some twenty-five years after its first discovery. They were cases of old, encysted trichinæ. All that was known about them was that they were encysted, that they did not exhibit any distinct sexual apparatus, and they did not appear to produce any distinct symptoms by their presence in the human organism.

But between the years 1850 and 1860, certain experimenters in Germany undertook to examine the natural history of this parasite more closely. They did so by administering portions of muscle infected with it to the lower animals; and they found—especially Leuckart, who was the most successful in these investigations—that the worms, apparently so insignificant in size, and so incomplete in development so long as retained in the muscular system, become further developed when introduced into the intestine of another animal. After a short time the sexual apparatus appears, copulation takes place, the female produces living young, and these young penetrate finally into the muscular tissue of the second animal, and there domicile themselves for an indefinite time. In this way somewhat more definite ideas were acquired with regard to the natural history of the worm, as found in the inferior animals. By a continuation of these experiments, it was found that this infection of the muscular system with trichina may show itself in the pig, the cat, the rat, the mouse, the rabbit, and, I believe, one or two other species of the inferior animals.

So far, nothing more had been learned

with regard to trichinosis as constituting a disease in the human subject. The new era in this respect opened with the year 1860. At that time an epidemic of trichinosis occurred in Germany. The members of a family living in Dresden were taken sick with symptoms similar to those of acute rheumatism, mingled with those of typhoid fever. One of them, a servant-girl, died, and on examination it was found that her muscles were filled with trichinæ. The attending physician and Professor Virchow tried the experiment of administering the trichinous muscles to this rabbit, and found that the rabbit became infected with the parasite, and died in about four weeks' time. The infected tissues of a rabbit were administered to a second, which became infected in the same manner, and died, like the first, in about four weeks. Finally, a third rabbit was fed with the flesh of the second, with a similar result. These experiments show that the disease, as it exists in the human subject, may be transmitted to the lower animals; that it may be transmitted indefinitely from one animal to another, the parasites passing alternately from the intestines to the muscular system, and again from the muscular system to the intestines. These are the general outlines of the origin and course of the disease known as trichinosis.

Now let us see what are the details of the anatomical structure and physiological development of the worm itself.

I have said that, as you examine the trichinæ in those cases where they have existed in the muscles for an indefinite period, where they have become encysted, and the cavity of the cyst has been invaded by calcareous deposit, it is not easy to make out their anatomical structure. But in cases where the disease is recent, and particularly where it can be traced to the recent use of trichinous flesh as food, the anatomy of the worm can be made out with more distinctness. Such a case happened in this city about five years ago. Some sailors, on board ship, were taken sick while in port with symptoms resembling those noticed in the Dresden family, similar to those of typhoid fever and acute rheumatism combined. It was found that the disease originated, in their cases, from eating raw pork or bacon. About the same time other cases of the disease became developed in persons living permanently in the city; and in these cases the difficulty could be traced to the use of ham imperfectly cooked.

A portion of this ham came into my possession, and in examining it, I found not only that the meat was trichinous, but also that the parasites were in a decidedly different condition from that which they exhibit in cases of long standing. The first peculiarity was that the cysts in which the worms were contained, instead of having definite and rounded ends, gradually tapered off into long and slender prolongations, the extremities of which could not be reached, being entangled in an intricate manner with the muscular fibres. In these drawings you see represented the cysts containing the trichinæ, as found in the ham. (Fig. 2.) In this case the cyst is evidently a hollow, fusiform tube, consisting of a transparent and structureless, but well-developed, membrane, containing the worm coiled up, as you see. From the two extremities of this fusiform cyst run off the prolongations. It is very important to ascertain exactly the structure of these prolongations. It is evident that they are tubular, and that their cavity is nearly continuous with that of the sac containing the worm. Not quite so, however, for it can be seen that a membranous partition runs across where the prolongations begin, so that the worm is enclosed in a distinct cavity; and that the prolongations are tubes of much smaller calibre, but were apparently at some previous time connected with the central cavity. Now this central cavity contains a transparent fluid; the worm is, therefore, lying free in the interior of the sac, not connected with its membranous walls; this can be demonstrated by breaking open the sac by a slight pressure between the glass plates. It ruptures, and discharges the worm, which escapes in such a manner as to show that it lay before perfectly free within the cavity of the sac. (Fig. 3.) The worm still remains coiled up, after its escape, and you will usually find much difficulty in uncoiling it sufficiently to examine its structure. No operation in microscopic anatomy requires more patience than this; for its firm folds must be unwound without rupturing any of its parts, in such a manner as to give you a fair view from one extremity to the other. (Fig. 4.) This done, the trichina, at this stage of development, is found to be a worm one twenty-eighth of an inch in length; its anterior extremity or head is tapering and pointed; the body very gradually enlarges as you pass from the anterior extremity towards the middle, and about the middle acquires its greatest diameter, which it retains throughout the rest of its extent, terminating posteriorly in a round, blunted extremity. The alimentary canal runs longitudinally throughout the whole length of the worm, there being a mouth at the anterior or pointed extremity, and an anus at the posterior or rounded end. About the junction of the middle with the posterior third of the parasite, the calibre of the alimentary canal suddenly contracts, then enlarges again, and afterward remains reduced to about one-third its original size. The only other organ visible at this time, is one which occupies, together with the alimentary canal, the posterior third of the worm; an organ apparently tubular in character, rounded at either end, and filled with rather large and tolerably well-defined cellular bodies. This evidently is the sexual apparatus, such as it exists at this time.

The characters which I have given are sufficient to define the encysted trichina as taken from the muscles. Suppose now a portion of muscular flesh, filled with trichinæ in this condition, be taken as food by the human subject or administered to one of the lower animals. On arriving in the small intestine, the worms are found to be perfectly free, for the muscular tissues in which they were imbedded, as well as the cysts in which they were contained, are digested in the stomach, so that within twenty-four or forty-eight hours you find an abundance of free trichinæ in the cavity of the duodenum. At once they begin to increase in size, so much so that very soon, usually by the fourth or fifth day, they have become three or four times as large as before. They have now arrived at the adult condition. At the same time the sexual apparatus, before so incomplete, has become perfect, and the copulation of the sexes takes place. I have myself, on several occasions, found in the intestine of the rabbit the two sexes in copulation, the male fastened upon the female at the orifice of the generative apparatus. The eggs having been impregnated, as the animal is viviparous, the female soon becomes full of the young brood.

In this drawing you see these parts as I have just described them. (Fig. 5.) Instead of the intestine now taking up the whole of the anterior two-thirds of the body, and a great part of the posterior third, you find that the sexual apparatus is by far the most prominent organ in the interior of the body of the female; and as soon as the young have arrived at the period of development here represented, they begin to move forward to the terminal duct of the generative apparatus. This can now be seen very clearly, running from the ovary forward to a point quite near the anterior extremity of the worm. The young are very numerous. I do not know that it has been calculated how many a single female is capable of producing, but they are probably very numerous. The young, discharged in this way into the cavity of the small intestine, begin to penetrate through its mucous membrane, by a boring process, passing undoubtedly through the entire thickness of the intestinal walls. This causes a great deal of irritation, which is the first symptom of trichinosis. It is usually sufficient to produce a considerable degree of pain and not unfrequently a smart attack of diarrhœa.

After passing through the walls of the intestine, the worms disperse in every direction, and from that time you begin to find them in the muscular tissue throughout the body. There they domicile themselves, and, within a fortnight after the symptoms have begun to manifest themselves in the human subject, you will find them almost everywhere, scattered throughout the voluntary muscles. They are still very small, having increased but little in size during their transit, so that when they first arrive in the muscular tissue they are not more than about 1-140th or 1-120th of an inch in length. They soon, however, become encysted, and then increase very considerably in size. At first, however, they are not enclosed in distinct sacs, but are found contained in the interior of long tubes.

We have already seen that, although the encysted trichina is contained in a sac or cavity of its own, this sac is often connected with prolongations running out from each extremity; and in the human muscle, within the first fortnight of infection, the young worms are found contained in swollen tubes. This is the condition of the worm as it was found in the muscles of the human subject on the thirteenth day of illness, in a case which I had the opportunity of examining. The worm, you see, is not free, but is contained in the interior of a tube, swollen or fusiform at the point where the worm lies partly coiled up. The worm is not stationary at this time, but by gentle pressure can be made to move from one end to the other of the swollen portion of the tube. By about the end of the first fortnight its coils assume a considerable degree of regularity, and the worm then reaches that condition which has given it its name of trichina *spiralis*.

We have now described the worm as domiciled in the muscular tissue. The next question is, how did it get there, and what is the nature of this tube which it now inhabits, and which is hereafter to become its cyst? These are points with regard to which some doubt still remains. Most of the German observers are agreed that this tube is a muscular fibre; they believe the worm passes from the intestine to the remotest regions of the body by boring its way through the intermuscular cellular substance; and that if examined on its first arrival there, it is perfectly free; that it then penetrates the substance of the muscular fibre, producing atrophy and degeneration of its substance, until the fibre becomes converted into the tube, with prolongations which I have described. On the other hand, it is possible that the worm, instead of working its way through the intermuscular cellular tissue, may also be transported by the circulation; for if it can bore through the walls of the intestine, it can, of course, also penetrate the bloodvessels, and it might thus finally reach the left side of the heart, and be sent with the current of the circulation to every part of the body. However, it is certain that the young trichinæ arrive at the muscular tissue, either by working their way through the intervening cellular tissue or by distribution by the bloodvessels. They very soon present themselves in the interior of these swollen tubes, which may be either capillary vessels that have become plugged, by coagulation of the blood, or by deposit of the exuded material excited by the presence of the worm; or may be muscular fibres that have undergone degeneration and atrophy from its presence. Soon the tube containing the parasite suffers a further alteration. An exudation takes place around the worm, so that that part of the tube containing it is shut off from the rest; and the remainder of the tube becomes atrophied into slender, tapering prolongations. After some years these also entirely disappear, and you see only an ovoid sac without prolongations; and finally you may have the cavity of the cyst invaded by a calcareous deposit, as I have already described—the last peculiarity of the degenerated cyst.

Now all these changes in the history of the trichina have been seen in the human subject: the development of the young in the body of the female; their discharge from the mother's body into the intestine; their penetration of the walls of the intestine and dispersion to the muscular tissue throughout the body; their domiciliation in the interior of the tubular cavities, and the change of the tubular cavities into ovoid cysts; the calcification of these cysts; and the quiescent and dormant condition of the worms as the result.

Now to what symptoms does this accident give rise? As I have already said, within the first ten days there is irritation of the intestines. In some instances this irritation is very great; and the greater it is, the more favorable the prognosis, as a general rule. After eating trichinous flesh, the patient generally begins to suffer within the first week, sometimes within two days. Now, if the irritation of the intestine be extreme, so that frequent and abundant evacuations are produced, the chances are very great that all, or nearly all, of the parasites will be discharged from the intestine. If so, the patient is safe. But if the irritation be not very marked, time is allowed for the young trichinæ to penetrate the intestinal walls, and enter the muscular tissue—from the end of the first to the end of the second week. This is the most dangerous period, the second stage of the disease. There is general pain and soreness, and œdematous swelling throughout the muscular system. At the same time, typhoid symptoms manifest themselves; the patient is debilitated, his pulse rapid, skin hot, tongue and lips dry, and his general appearance closely resembles that of a patient with typhoid fever.

The passage of the worms into the muscular tissue, and the changes taking place there, are very apt to produce symptoms which result in the patient's death at or before the end of the fourth week. By that time the worms have become completely encysted, and after this the symptoms of irritation begin to disappear. The muscular system becomes habituated, as it were, to the presence of the parasite; and after a while the symptoms all subside; the patient can move his limbs as before, and then considers himself as entirely recovered.

How long may the worms remain in this quiescent condition in the interior of the muscular system. In 1863, Prof. Langenbeck, of Berlin, was operating upon a patient for a tumor of the neck, situated upon the surface of the sterno-mastoid muscle; in dissecting it off, the fibres of this muscle were disclosed, and it was noticed that their surface was covered with minute white specks. These attracted so much attention that a portion was excised and submitted to the microscope, when the specks were found to be encysted trichinæ. After the patient's recovery, minute inquiries were made to ascertain at what time he had become infected. The result was that no such attack could be traced to a period less remote than eighteen years before. At that time, viz., in 1845, the patient, with several associates, was serving upon a committee of inspection of the public schools. After the inspection in a certain district, the committee partook at the village inn of a lunch, consisting, in part, of ham. Very soon after, all the members of the committee were taken sick with symptoms similar to those we now know to be attributable to trichinosis. Two of them died, and the symptoms of poisoning were so marked that the innkeeper was arrested and held under this charge for a considerable time. Although, finally, the circumstances were not found sufficient for his conviction of the crime, yet they were considered as so much against him, and the prejudices of the community were so excited in consequence, that he was obliged at last to leave the place. On going over all the history of the case, so far as it could be ascertained at that time, it left an undoubted impression on the minds of the medical men who made the investigation, that at the time before mentioned, viz., in 1845, the members of the committee were infected with trichinæ from the ham used for their lunch; that two of them had died in consequence; and that Prof. Langenbeck's patient had recovered, and the worms remained encysted for eighteen years afterwards. How much longer they may thus remain I do not know, but I see no reason why they should not last for the remainder of the patient's life. They produce in this condition no interference with the health, and hardly seem to interfere even with the vigor of the muscles.

This was the condition in which the trichinæ were nearly always found, prior to the year 1850, and from this fact it was supposed that the trichina was a harmless parasite. Such are the chief circumstances connected with the physiological history of the worm.

There still remains one question of a very important nature—How great is the liability of the community at the present time to be infected, and what measures can be taken to prevent it?

The pig seems to be the animal naturally the most liable to trichinosis. He is certainly more liable to this disease than any other animal used for food, neither the sheep nor the ox being subject to it. It has been found in this country, by investigations in Chicago in 1866, that of all the pigs brought to market in that city, one in fifty is infected with trichina. This shows that we are all in danger of becoming infected by the use of pork, unless measures are taken, in preparing the meat, to destroy the vitality of the worms. Smoking and salting will not do this effectually. Only thorough cooking is to be relied on as a safeguard. It is remarkable that most, if not all of the cases of trichinosis in this country, thus far, have occurred among the Germans. This is because they have the habit, not otherwise common here, of eating ham, sausages, and even sometimes fresh pork, nearly or quite in the uncooked state. To kill the worms the ham must not only be salted and smoked, it must be cooked, and cooked thoroughly. Now, if you bear in mind that one pig in fifty is infected with trichina, you will perhaps think many times before putting between your lips a piece of pork, or ham, or sausage in the raw state; you will be certain that it is cooked; and not only that, but thoroughly cooked. One of the worst cases of trichinosis that has come under my observation was caused by eating pork chops which were rare or slightly underdone. Now, these chops were probably well enough cooked on the outside; but on the inside they were red and juicy, and the danger was precisely the same as if the patient had taken the meat entirely raw. In order to destroy the vitality of the trichina, the meat should be subjected to a temperature of 212° F. Now, if you boil a ham for half an hour, or even an hour, you do not necessarily subject all parts of it to this temperature. In the central parts of the ham the temperature will not rise to that point unless the boiling has been long continued. I speak of this particularly, as it is a very important matter. A temperature of less than 160° F. does not destroy the trichina. As shown by direct experiment, therefore, a piece of trichinous meat, any part of which has not been raised to or above this point, is just as dangerous as if it were taken in the raw state.

These are the chief points of importance in regard to the trichina and trichinosis. The disease is fatal enough, frequent enough, and revolting enough to induce us to take all possible measures to prevent it, and I do not think anything is sufficient for this but a personal examination of every piece of pork, ham, bacon, or sausage used as food, to see that every part of it has been subjected to a thorough cooking process.

One other point still I should like to speak of. We have seen that the disease shows itself occasionally in the human subject, but very frequently in the pig. Now, how is it, under these circumstances, that the continuance of the species of trichina spiralis is provided for by nature? We have here an animal that arrives at maturity in the intestine of the human subject. In that situation the female bears living young in consequence of the individual having eaten pork filled with the encysted and quiescent trichinæ. So long as these remain encysted and quiescent in the pig's muscles, they remain practically undeveloped and practically sexless. This flesh is eaten by the human subject. In the intestines of the human subject the worms are set free, the females are impregnated and bear young, and these scatter themselves throughout the body. Now, when these young have, in their turn, in the human subject arrived at the period of quiescence, how are they ever to get back to the intestine of a living animal, and so become capable of continuing their species?

I presume that the mode by which the race is continued is this: Suppose we start with the pig infected with quiescent and sexless trichina. This pig is butchered. You know that butchering establishments are the abundant resort of rats, which feed upon the refuse scraps of meat, and of course these after a time become infected with trichina. The worms are developed in the intestine of the rat, and produce living young. These not only infect the muscular system of the rat, but they are also discharged with the fæces. These fæces become mingled with the food of the pig—an animal, as we know, not very fastidious with regard to his food, and consequently subject to several parasitic diseases—and thus the round of development of the trichina is completed. Again, its perpetuation is provided for by a similar round between the cat and the mouse. The mouse becomes infected by feeding upon refuse meat, and the cat by devouring the mouse or rat. We have, therefore, the natural history of the animal, embracing in each case two different phases, in one of which it undergoes an active development, in the interior of the intestine, while in the other it assumes the quiescent form, becoming encysted in the substance of the muscular system.

There are other points of considerable interest with regard to the rapidity with which the human subject may be infected, the great number of persons who may become infected by eating the product of a single slaughtered animal, and the degree of fatality attending the disease. Enough, however, is known to convince us that the affection is a very frequent one, and liable to be exceedingly fatal, or if not fatal, to produce prolonged and exhausting disease. Much would be effected if all pork offered for sale in the market could be subjected to inspection, and this has been done in some parts of Germany; pork being liable to infection not only with trichina, but also with cysticercus, producing tapeworm in the human subject. Such inspection would undoubtedly prove very useful. Still it would not afford complete protection, unless carried out with an amount of detail which would in all probability prove practically unattainable. The only absolute protection, therefore, must be that exercised by the individual for himself. He must see that he never uses for food any kind or preparation of pork in any form not so thoroughly cooked as to destroy every possible vestige of parasitic life.

Auricular Hæmatoma of the Insane.—The *Gazette Hebdomadaire, &c.*, adds to a previous report of one of Prof. Brown-Séquard's communications to the Academy of Medicine, that that gentleman compared the *auricular hæmatoma of the insane* to the hæmorrhage into the tissues of the ear produced by his artificial lesions of the *corpora restiformia.*

Reproduction of lost Members.—The same journal gives a note from M. Philipeaux, in which from certain new experiments he draws the conclusion that, as a general law, among vertebrate animals at least, an organ entirely removed can never be replaced—that when an organ is regenerated the basilar portion has not been removed.

Subcutaneous Medication for Syphilis.—Dr. Max Van-Mons has reported in the Brussels Academy five cases of secondary syphilis, with indurated chancres, treated by the subcutaneous injection of calomel. Three of the cases received two or three injections each (quantity not stated) at intervals of about twelve days. At the time of writing, these were nearly or quite cured, after the lapse of 37, 20, 19 days respectively; and the remaining two cases, which had each received one injection, only eight days previously, were notably improved. If this discovery is verified, it will prove one of the most important ever made in reregard to the treatment of syphilis.—*Wiener Med. Wochenschrift*, No. 24. D. F. L.

Removal of Urinary Calculi.—Dr. Paul F. Eve has operated more than one hundred times for the removal of urinary calculi.—*N. Y. Medical Record.*

Medical Miscellany.

Middlesex North District Medical Society.—At the annual meeting of this Society, held in Lowell, April 28th, the following officers were elected for the year ending April 27, 1870: Joel Spalding, of Lowell, *President*. Levi Howard, of Chelmsford, *Vice President*. John H. Gilman, of Lowell, *Secretary*. N. B. Edwards, of North Chelmsford, *Treasurer*. Franklin Nickerson, of Lowell, *Curator and Librarian*. John O. Green, of Lowell, *Commissioner of Trials*. *Standing Committee*.—George E. Pinkham of Lowell, Charles Dutton of Tyngsborough, Moses G. Parker of Lowell. *Councillors*.—Charles A. Savory of Lowell, John C. Bartlett of Chelmsford, Walter Burnham of Lowell, Joel Spalding of Lowell, Nathan Allen of Lowell, Francis C. Plunkett of Lowell. *Censors*.—Nathan Allen of Lowell, Charles A. Savory of Lowell, N. B. Edwards of North Chelmsford, Hanover Dickey of Lowell, Daniel P. Gage of Lowell.

Delegates to the Convention of the American Medical Association.—Geo. C. Osgood, George Munroe, David Coggin, Joseph H. Smith, Kirk H. Bancroft, W. H. Leighton.

Was Socrates poisoned by hemlock? Was he poisoned by anything? Was there ever any Socrates, any Homer, any Shakspeare? Well, we have got as far in these investigations as this. The scientific are doubting if hemlock is poisonous; but they do not know whether they mean by hemlock the thing referred to in the classic story. Alas! if boyhood has conned that Greek lesson for nought!

Academie de Medecine.—The place in the Section of Surgical Pathology left vacant by the death of M. Velpeau, has been filled by the election of M. Verneuil.

Dr. H. H. A. Beach has been appointed Assistant Demonstrator of Anatomy in the Medical School of Harvard University.

In his Tuesday's lecture, Dr. Richardson performed a somewhat remarkable experiment in confirmation of an observation originally made by John Hunter. Hunter observed that if fresh muscle be frozen, in the act of thawing muscular contraction will take place. Dr. Richardson has devised an experiment by which the fact may be audibly and visibly demonstrated. If a freshly denuded muscle be first frozen with ether spray and then immersed in a freezing mixture, it may afterwards be gradually thawed by being held horizontally by a piece of cord over water at 120°. If one end of the cord be made fast in the vessel holding the water and the other end be fastened to the trigger of a pistol, and the temperature of the muscle be then suddenly raised by placing a spirit lamp under the vessel containing the water, and heating it to 125°, the muscle contracts sufficiently quickly and forcibly to fire off the pistol.—*London Medical Times and Gazette*, April 10.

Danger of giving strong Doses of Camphor.—A case illustrating the above has recently been brought under the notice of the Société de Médecine et de Pharmacie de Grenoble. An enema consisting of five grammes of camphor dissolved in the yolk of an egg was given to a child three years of age suffering from typhoid fever. Symptoms of poisoning soon manifested themselves—convulsions, lividity of the countenance, stupor, arrest of the urinary secretions, &c. The employment of coffee sufficed to restore the child. —*N. Y. Medical Record*.

The Discovery of a Minute Fossil Horse.—Professor Marsh, of Yale College, has discovered in the tertiary deposits of Nebraska, the minutest fossil horse yet obtained. It is only two feet high, although full grown. This makes the seventeenth species of fossil horse discovered on this continent.—*Ibid*.

Diabetes cured by Peroxide of Hydrogen.—Mr. J. J. Bayfield (*British Medical Journal*) reports a case of diabetes cured by peroxide of hydrogen. He commenced with half-drachm doses of the ethereal essence of the peroxide, and gradually increased it to three drachms a day.—*Ibid*.

MEDICAL DIARY OF THE WEEK.

Monday, 9, A.M., Massachusetts General Hospital, Med. Clinic. 9, A.M., City Hospital, Ophthalmic Clinic.
Tuesday, 9, A.M., City Hospital, Medical Clinic, 10, A.M., Surgical Lecture. 9 to 11, A.M., Boston Dispensary. 9–11, A.M., Massachusetts Eye and Ear Infirmary.
Wednesday, 10, A.M., Massachusetts General Hospital, Surgical Visit. 11 A.M., Operations.
Thursday, 9 A.M., Massachusetts General Hospital, Medical Clinic. 10, A.M., Surgical Lecture.
Friday, 9, A.M., City Hospital, Ophthalmic Clinic; 10, A.M., Surgical Visit; 11, A.M., Operations. 9 to 11, A.M., Boston Dispensary.
Saturday, 10, A.M., Massachusetts General Hospital Surgical Visit; 11, A.M., Operations.

To Correspondents.—The following communications have been received:—Caoutchouc in Skin Diseases—Abuse of Charity Medicine—Review of Wells on the Eye—Review of Pamphlet by Dr. Gautillon—Charity Medicine.

N. B.—If any communication accepted after the date of those announced in last week's issue should be printed in advance of any of them, it will be because it happens to fill a gap in making up a number.

Pamphlets Received.—Surgical Cases. By David W. Cheever, M.D., Adjunct Professor of Clinical Surgery in Harvard University; Surgeon to the Boston City Hospital.

Deaths in Boston for the week ending Saturday noon, May 1st, 86. Males, 44—Females, 42.—Abscess, 1—accident, 1—anæmia, 1—apoplexy, 3—disease of the brain, 1—inflammation of the bowels, 1—bronchitis, 3—cancer, 3—consumption, 18—convulsions, 3—diabetes, 1—diarrhœa, 1—diphtheria, 1—dropsy, 2—dropsy of the brain, 1—erysipelas, 1—scarlet fever, 12—typhoid fever, 2—infantile disease, 1—disease of the kidneys, 2—inflammation of the lungs, 9—marasmus, 3—old age, 5—paralysis, 3—premature birth, 1—puerperal disease, 2—rheumatism, 1—unknown, 2—whooping cough, 1.

Under 5 years of age, 32—between 5 and 20 years, 6—between 20 and 40 years, 21—between 40 and 60 years, 15—above 60 years, 12. Born in the United States, 60—Ireland, 20—other places, 6.